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ART. XCII.—*Description of Equisetum hyemale, Mackaii and variegatum, as found on the banks and in the bed of the River Dee; with additional observations.* By J. B. BRICHAN.

EQUISETUM *hyemale.*

Root creeping, jointed, branched. Stems several from one branch of the root, or branched at the base, one to three feet high, or upwards, stout, erect or decumbent, articulated and fluted, occasionally throwing out catkins or very small branches near the top. Ridges or furrows fourteen to twenty-one in number, in luxuriant specimens twenty-eight; ridges grooved, and, as well as the furrows, grained like a file. Sheaths widest at top, at first pale green, with a black crenate rim; afterwards entirely black; ultimately white, with a broad black band at the base, the rim remaining black as before. The uppermost sheaths of the root *generally*, and the upper and lower of the *younger* stems *occasionally*, bear black, membranous, flexuose, deciduous teeth or bristles. The sheath of the catkin is invariably and persistently toothed. Catkins terminal, more rarely lateral, and in that case either single or in opposite pairs.

Equisetum Mackaii.

Root creeping, jointed, branched. Stems several from one branch of the root, or branched at the base, slender, often filiform, erect or decumbent, one to two and a half feet high, consisting of articulations from one to two and a half inches in length. The older stems frequently throw out long slender branches, which generally bear catkins. The stems are fluted, the ridges grooved, and both ridges and furrows grained as in E. hyemale. Number of ridges or furrows eight to twelve. Sheaths cylindrical, at first pale or yellowish green, with a narrow black band immediately under the teeth; ultimately wholly black, with the lower border of the black entire. Teeth equal in number to the ridges, membranaceous, white at the edge, long and tapering, terminating in a flexuose bristle which is generally black, but sometimes white, in which case the white margin of the teeth is broader: they often adhere in pairs, and are decidedly persistent.— Catkins terminal, either on the stems or on the branches.

Equisetum variegatum.

Root creeping, jointed, branched. Stems many, three to twenty inches long, branched at the base and upwards, generally but not invariably decumbent and filiform, rather brittle, consisting of numerous fluted articulations, half an inch to an inch and a half long. Ridges or furrows five to nine, the former grooved, and both grained as in E. hyemale and E. Mackaii. Sheaths slightly swollen upwards, the upper half black. Lower border of the black waved or toothed, the dentations alternating with the teeth, and, like them, equal in number to the ridges. The teeth are distinct, never adhering, obtuse, somewhat ovate, black in the centre, with a broad, white, membranous margin, and tipped with a short bristle, which is either black or white, and more or less deciduous, while the teeth themselves are persistent. Catkins terminal, rather large in proportion to the size of the plant.

These descriptions are intended to apply to the plants only "as found on the banks and in the bed of the river Dee," and as seen either with the naked eye or through a small lens. I have endeavoured to exclude everything that could not with propriety be admitted as a specific distinction. The characters which I have given, and which I find to be constant, together with the various circumstances noticed in what follows, have led me to the conclusion that the three plants are well entitled to be ranked as distinct species. I conceive that the main strength of my position lies in the fact, that amidst all the varieties of size and shape which each plant presents, the distinctive characters remain the same. The species never *shade off* into one another, the smallest specimen of the largest species being readily distinguished from any specimen of the other two; while, on the other hand, the stoutest stems of E. Mackaii and variegatum can at once be recognized as distinct from each other, and from the slenderer stems of E. hyemale. The following additional remarks apply chiefly to the situation, stems, sheaths, catkins and branching.

Situation.— The three plants are found at various parts along the course of the Dee, within the parish of Banchory, extending over a space of six or seven miles in length. There are three distinct stations for E. hyemale, four for E. Mackaii, three for E. variegatum, and several intermediate spots in which detached plants of each species or variety, especially of E. Mackaii, occur. I have no doubt whatever that both above and below the part where these stations are, there exist other localities hitherto unrecorded. In no instance have I seen E. hyemale associated with either of the other two, although E. Mackaii grows in its immediate vicinity. In two of the localities E. Mackaii and variegatum grow together, sometimes in juxta-position so close that they seem to spring from the same root. The three grow both upon the banks of the river and in the water, E. hyemale being generally highest and driest, whilst E. variegatum shows most of a tendency to *take the water*. The former seems to attain its largest growth among loose dry earth, especially where it finds shelter among large stones and trees or bushes, and insinuates its long straggling roots between and under the stones. E. Mackaii appears to prefer a locality where water, oozing from the bank, forms a green moist spot, or finds its way through a rent made by the river, or a channel worn by itself. The water where E. Mackaii thus fixes its habitat, is generally, *if not invariably*, chalybeate, being accompanied by that orange-coloured mineral or vegetable substance, and exhibiting on its surface that bluish-grey silvery scum, both of which are said to indicate the presence of iron. On the brink and in the cavities of such a spot the plant luxuriates freely, and assumes all its different forms,—short, tall and branched. E. variegatum is found in similar situations, generally running farther into the river, and the roots of both plants are frequently stained with the orange-coloured matter just mentioned. E. variegatum manifests a disposition to run its roots under large stones and grow beneath their shelter, where, and in the water, it is most luxuriant. From the stations assigned to it I am inclined to think that its natural habitat is "on the banks and in the bed" of rivers; and that, when found among sand, it has been carried down by the stream at whose mouth it grows: its greater growth in water seems to favour this conclusion. I think that when E. hyemale and E. Mackaii grow entirely in water, they are much smaller than in their peculiar situations already described.*

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* Since writing the above I have seen another station for Equisetum Mackaii, and one for E. hyemale, both farther down the river. In these both plants grow more sparingly, — E. hyemale upon a hard, dry, grassy bank, decumbent, almost prostrate, and much more slender than usual; E. Mackaii in the immediate neighbourhood of *mineral* water, but growing partly, as it does in some of the other stations, among loose stones in the river's bed, and also nearly prostrate.

Stems. — The longest stem of E. hyemale I could find measured three feet two inches: it consisted of eighteen articulations. Several other stems measured nearly three feet in length. The longest articulation on any stem examined was about three and a half inches; occasionally a very short internode occurs among the rest, and there are sometimes two or three such in succession.

The thickest stem I observed was, in various respects, peculiar. It was composed of eleven principal articulations, the seventh of which, broken by accident, was bent at about a right angle to the lower part of the stem. The eleventh articulation was about one inch in length, and in it was inserted a sort of double stem, or rather a couple of stems, one of which, about one fourth the diameter of the original, consisted of four short articulations, having about twenty striæ, all that remained of the other being the decayed basal sheath. The broken internode and sheath were wet with an orange-coloured liquid, which, when touched, stained the hand. The cause seemed to be, that rain had lodged in the sheath and spread itself over part of the internode. Both, when dry, were partly quite black and partly of an orange colour. Does this indicate the presence of iron in the plant? I have already mentioned the fact, that I generally find E. Mackaii and E. variegatum in the vicinity of water impregnated with that mineral.

Another stem, growing in the river, had but five articulations, the upper part having decayed. At the top of the fifth articulation there were two opposite branches, the one upwards of thirteen inches long, the other rather shorter, each having twelve articulations, besides the black radical sheath. The sheaths of the main stem had fallen off, and a few setiform *black* teeth were present on the upper and lower sheaths of the two branches.

The *standard* or *normal* number of striæ both on this plant and on the other two, appears not to depend either on the length or thickness of the stem. The greatest number I have found on one of the most luxuriant stems, but not the stoutest, is twenty-eight; the smallest number, but not on the smallest stem, fourteen. On some of the most slender stems I have counted twenty-one, which I consider the *standard* number. The striæ diminish in *breadth*, but not generally in *number*, as they approach the top of the stem, nor is the greatest number always found on the thickest internode. Taking an average stem of each plant, E. hyemale appears to have the narrowest ridges; E. Mackaii the widest ridges and narrowest furrows; E. variegatum, ridges and furrows of nearly equal width, and, if there is any difference, rather broader than those of E. hyemale. From this cause stems of E. Mackaii and variegatum can at once be distinguished, at least in their recent state, by holding them between the eye and a light; E. Mackaii appears almost quite opaque, the furrows being scarcely seen, while E. variegatum and E. hyemale under the same circumstances appear semitransparent.

No stem of E. Mackaii that I have seen deserves a particular description. The longest I measured was two feet five and a half inches in length, the next longest two feet four inches. The number of articulations is about the same as in E. hyemale, the terminal one, when in fruit, being usually much longer than in the latter plant. The standard number of striæ I take to be eleven.

Of E. variegatum I have found no stem longer than about twenty inches, exclusive of the smallest portion of the root; the usual length is from three to ten. On one of the longest stems I have counted upwards of thirty articulations, the shortest has no fewer than eight; the terminal articulation, when bearing a catkin, is longer in proportion to the size of the plant than that of E. hyemale. It is likewise as stout as any on the same stem, often the stoutest of all. The standard number of striæ is eight.

The structure of the cuticle is undoubtedly the same in each species or variety; the largest plant having the narrowest striæ. In all, the furrows are more minutely grained than the ridges. It appears to me, however, that the structure of the cuticle in all the Equiseta is more or less the same, though the siliceous tubercles may not be disposed with the same regularity.

Sheaths.—These in E. hyemale have only two thirds of their length coloured differently from the internodes; in E. Mackaii two thirds or one half; in E. variegatum never above one half: the lower third or half being concolorous. In this I think they differ from some of the other Equiseta, whose sheaths are wholly coloured in a different manner from the stems. The colour changes according to the growth of the plant, as above described.

After a good deal of searching, and examination of many specimens, I have not found the semblance of teeth upon the sheaths of E. hyemale, except on one or two of the younger stems and branches, and generally on the upper and lower sheaths. When present they are wholly black, subulate, and flexuose; they are extremely fugacious, and, from their rare occurrence, appear to me to be quite accidental. The sheath which embraces the catkin has always rather large, coarse, black, flexuose, persistent teeth, unlike the delicate membranaceous teeth of E. Mackaii and variegatum The sheaths, having first split longitudinally along the furrows, fall off before the plant has decayed.

The sheaths of E. Mackaii invariably bear teeth such as are described above. They remain longer on the plant than those of E. hyemale, and the teeth and bristles seldom, if ever, fall off before them.

In E. variegatum the bristle alone is usually deciduous. The teeth remain till the sheaths decay, which they do in the same manner as in E. Mackaii. In both the teeth of the uppermost sheath differ from the rest, only in being larger and in having shorter bristles.

The sheaths of all three turn more or less white before their final decay. When they begin to split or fall off, the part of the internodes which they have covered is of a pale green colour, like that of the sheath in its first stage. Soon after it begins to turn black and swell, and thus the plants in *extreme old age* become bent and geniculated. This, however, is quite different from the sinuous appearance which the stem sometimes assumes when in perfect vigour.

Catkins. — These, like the other parts of the plant, are well described by Mr. Newman. While the catkins of E. hyemale, in one of the stations on the Dee, expand freely and shed their seed or pollen, I have not in any case observed those of E. Mackaii or variegatum to expand at all. They appear to ripen without expanding or rising fully out of the sheath.

On the top of many stems of E. hyemale I observed a pile of small, dark brown, membranous, elastic, conical, inverted sheaths, of the same substance as the teeth of the sheath which embraces the catkin, increasing in width upwards, and so closely embracing each other that the rim only of each is seen, except the highest and largest, which gives the top of the pile a conical shape. Although scarcely an inch in length, it resembles an *inverted abortion* of the plant. Its lower end is at first inserted in the uppermost sheath, and surrounded by several small sheaths of a texture similar to its own, and placed within each other. It is afterwards quite protruded, and gradually falls off, leaving a flexuose apex, somewhat like that of the catkin, whose formation I am persuaded it precedes. On dissecting the top of several stems from which the pile of cones seemed but recently to have fallen, I found the germ of the catkin completely enclosed within its sheath, the teeth of which, not yet separate, form by their union the apex which appears when the pile falls off. Dissection, however, when the cones are present, seems often to discover an *abortive* germ. The number of inverted sheaths in one of these piles is about twelve; what their peculiar function may be I cannot even conjecture: I do not find anything analogous either on E. Mackaii or on E. variegatum.*

Branching.—On what the branching depends I am unable to say. It is sometimes not easy to distinguish between branches and stems; the only distinction I can suggest seems almost a truism. Stems arise from the root, and branches from the stem. As the root is always black, they can therefore be in general distinguished, if this method of distinction is attended to. And I think it will generally be found that E. variegatum is the only plant of the three that can strictly be said to branch from the base, inasmuch as it does so in all circumstances, while the other two can scarcely be said to throw out basal branches, except when the stem has been broken off, or has decayed almost at the root. The three are occasionally branched near the top of the stem. With respect especially to E. hyemale and Mackaii, it may be said that this appears, in every instance, an effort of the plant to prolong its existence. It is always in older or broken stems that such branching takes place. E. hyemale is least subject to this manner of growth, and when branched, rarely throws out more than a single branch. I have not observed one above two or three inches long, except in the solitary instance of the stem before described. Sometimes, instead of a branch, a single catkin, and more rarely a pair of opposite catkins, appears.

E. Mackaii is, for the most part, unbranched, but of the three it is most liable to branching from the upper part of the stem. In this case the most frequent number of branches is three, and these, springing from different parts one above another, are either horizontal, or vertical, or variously inclined. Sometimes there is but one branch, sometimes there are four, of which two are occasinally opposite. They generally, but not always, bear catkins, and that more abundantly than those of the other two varieties. The general length of the branches is from three to seven inches; sometimes it is a foot or upwards.

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* Subsequent observation has enabled me to ascertain the following facts. The sheaths which in E. hyemale surround the base of the pile of cones, are the ***rudiments*** of several of the upper articulations of the stem. The base of the pile embraces the rim of the innermost sheath, and within these the catkin and its sheath are, in their germinal state, completely enclosed. It is only when these incipient internodes prove abortive, that they appear of a *texture similar* to that of the crowning deciduous pile. *They are entirely destitute of teeth.*

The apex of the stem of E. Mackaii, previously to the appearance of the catkin, proves, when dissected, to be composed of the converging teeth of a sheath which encloses several others disposed in a similar way, and having long, black, subulate teeth, like its own. As in E. hyemale, the germ of the catkin is found within, thus protected in its embryo state. The manner of growth in E. variegatum is exactly the same, but the teeth in every stage are somewhat white at the edge.

What length of time stems thus gradually developed require to attain their full growth, I cannot say. This, and many other particulars respecting these plants, might form very interesting subjects of observation to those by whom they are cultivated, or to those who have leisure to study them in their natural state.

E. variegatum, as already observed, *naturally* branches from the base, and, it may be added, from *all* parts of the stem. Its branches vary in length from one to fifteen inches. I know not whether the following description be worth notice, but it may perhaps illustrate the mode of growth frequently adopted by the plant, and the difficulty of distinguishing between stems and branches. On part of an ascending root five inches long, growing at the side of a large stone almost in the water, I found eight distinct ramifications. The four lowest were simple and perfect, the other four broken, or decayed, and branched. The lowest of the latter had three undivided branches; the next, which rose from a branch of the root, had seven branches, two of which had each a branchlet: the next had one divided branch, and the highest had three branches, one of which was divided. Besides all these it threw out another root, which bore the remainder of a branched stem. A piece of the stem which formed a continuation of the primary root remained in a decayed state, and also appeared to have been branched. None of the ramifications exceeded a few inches in length.

Mr. Newman has kindly furnished me with specimens of the Dublin Canal plant, which he considers a variety distinct from that which grows in the Dee. To me they appear identical; that from Dublin being not more luxuriant than many specimens I have gathered here.

Some of the remarks now made may appear unimportant, and even puerile; but in so far as they contain facts, they must possess at least *some* value, and perhaps there is not too much presumption in the hope that they be the means of leading others to institute similar investigations. To myself the particulars above so minutely detailed are valuable on two accounts; first, because they have served to convince me more of the distinctness of the plants in question as species; and secondly, because I am of opinion that the advance of botanical science, as well as of all other sciences, depends more upon the particular inquiries made by individuals than upon the general knowledge acquired without much investigation by the generality. I may be allowed to add, that although I have come to a different conclusion from Mr. Newman's, with regard to the plants I have attempted to describe, and have been most kindly encouraged by that gentleman to study the matter, and to publish the result of my inquiries, I feel all the deference due to authority so high, and therefore much diffidence in declaring myself to be of an opposite opinion.

J. B. Brichan.

Manse of Banchory,
October 4, 1842.

Art. XCIII.—*Additions to the List of Plants met with in the neighbourhood of Swansea*, (Phytol. 104, &c.). By T. B. Flower and Edwin Lees, Esqrs. *Communicated by* J. W. G. Gutch, Esq.

38, Foley Place, March 31, 1842.

Sir,

Through the kindness of my friends Mr. Edwin Lees, of Malvern, and Mr. T. B. Flower, I am enabled to send you the following addenda to my Swansea Flora, of plants which had escaped my notice.

I am, Sir, truly yours,

J. W. G. Gutch.

To the Editor of 'The Phytologist.'

Ranunculus aquatilis, var. *β. pantothrix*. Frequent in watery places about Swansea.

——— *arvensis*. In Cornfields about Newton, and also near Caswell Bay.

——— *auricomus*. Frequent in the woods.

——— *circinatus*. Cromlyn Burrows and about Neath.

——— *Ficaria*. Frequent about the neighbourhood, with R. reptans.

Delphinium Consolida. I have in my herbarium two specimens of this plant gathered on the sandy shore of the bay, where it then appeared truly wild,—June, 1828; (E. Lees).

Papaver Argemone. In the cornfields, frequent.

Chelidonium majus. On old walls about Neath and Britton Ferry.

Fumaria officinalis. Common in cultivated ground and about hedges.

Cardamine pratensis. Frequent.

Draba verna. On old walls in the neighbourhood of Swansea.

Sisymbrium Sophia. On the shore on the other side of the Ferry. This is very scarce in Worcestershire; (E. Lees). Waste ground about the Infirmary, and in many other places.

——— *officinale*. Common about hedge-banks.

Viola canina. In the woods.

—— *odorata*, var. *β. imberbis*. Hedge-banks, frequent.

Polygala vulgaris, var. *β. oxyptera*. On the Downs near Pennard Castle, and frequent in other places.

Hypericum hirsutum. In thickets and hedges in the neighbourhood.

Dianthus Armeria. Banks about Britton Ferry, but not frequent.

Spergula nodosa. Frequent on the sand hills between Swansea and the Mumbles.

Sagina maritima. About Salt-house Point.

——— *apetala.* On walls and waste places, very common.

Mœhringia trinervis. In shady bushy places, common.

Stellaria aquatica. Frequent in watery places.

Tilia microphylla. You have a habitat for this I see; but it also grows in a wood between Gower Inn and Penrice, (E. Lees).

Geranium lucidum. On old walls about Newton, and other places in the neighbourhood, with G. rotundifolium.

——— *pyrenaicum.* Between Swansea Ferry and the race-course.

Chrysosplenium oppositifolium. In watery shady places.

Adoxa moschatellina. Frequent under shady hedges.

Saxifraga tridactylites. On walls and dry barren ground.

Euonymus europæus. In the hedges; also frequent about Neath.

Ononis antiquorum. In neglected pastures about the neighbourhood.

Melilotus officinalis. In the hedges and borders of fields.

——— *vulgaris.* Ballast-heaps near the west pier.

Trifolium arvense. Swansea and Sketty Burrows.

Medicago lupulina. In pastures and cultivated fields.

——— *minima.* I gathered this on the descent of a steep rock, close to the sea, eastward of the perforated rock in Oxwich Bay, 1839. It must be looked for on hands and knees, being nearly buried in sand and soil, but deserves the trouble required to attain it, from the curious structure of its legumes, (E. Lees).

Ervum tetraspermum. In the hedges and cornfields.

——— *hirsutum.* In cornfields and other cultivated ground in the neighbourhood.

Hippocrepis comosa. On dry chalky banks.

Sanguisorba officinalis. In moist meadows at the base of Craig-y-llyn-Vawr, vale of Neath, (E. Lees). Common in boggy meadows at Witch-tree bridge; and also at Neath.

Poterium Sanguisorba. On the hills, abundantly.

Geum rivale. At Cil Hepste, vale of Neath, (E. Lees).

Rosa villosa and *tomentosa.* I rather wonder you have not recorded these, nor Mr. Dillwyn either. They are eminently conspicuous and beautiful with their *deep red* flowers, in the vale of Neath, in June and July, especially about the Mellte waterfall, and at Pont Henrhyd. Rosa arvensis is very common about Swansea, (E. Lees).

Rosa systyla. This is *rare;* you have it *without* any assigned locality. I gathered it in Gower by the side of the road between Pennard and Penrice, (E. Lees).

Œnothera biennis. Naturalized in many places about Swansea and Britton Ferry.

Torilis infesta. In fields and by waysides with T. nodosa.

Pastinaca sativa. About the borders of fields.

Heracleum Sphondylium. In the hedges and meadows, common.

Æthusa Cynapium. In cultivated ground; much too common a weed.

Sium angustifolium. In ditches and rivulets.

Sison Amomum. Frequent under hedges in the neighbourhood.

Anthriscus sylvestris. In the hedges, very common.

Scandix Pecten-Veneris. In waste fields, common.

Galium palustre, var. *β. Witheringii*. In moist meadows and ditches.

——— *uliginosum*. In watery places.

Sherardia arvensis. In fields on a light soil.

Sambucus nigra. In the hedges and woods.

Hedera Helix. In woods and on old buildings.

Campanula Trachelium. In Gower, by the side of the road between Penrice and Port Eynon; numerous specimens, (E. Lees). In hedges and thickets.

——— *glomerata*. By the sides of the hills in dry open pastures.

Valeriana officinalis. In woods and marshy places.

——— *dioica*. In moist boggy meadows.

Solidago Virgaurea. In the woods, frequent.

Senecio tenuifolius. In woods and hedges and by road-sides.

Centaurea nigra, var. *β. radiata*. In pastures and by road-sides.

Sonchus arvensis. In corn-fields and hedges, frequent.

——— *asper*. Frequent, with S. oleraceus.

Lactuca muralis. On old walls, also frequent about the Mumbles Castle.

Helminthia echioides. About hedges and the borders of fields.

Picris hieracioides. On dry banks, frequent.

Symphytum officinale, with var. *β. patens*. Frequent in watery places.

Myosotis collina. Frequent on dry walls.

——— *palustris*. Common in watery places.

——— *repens*. Cromlyn Bogs and marshy places, frequent.

Verbascum nigrum. About the banks of Britton Ferry.

Solanum Dulcamara. In the hedges, frequent.

Statice Limonium. Very beautiful and luxuriant in crevices of the rocks stretching from the shore into the sea at Port Eynon, (E. Lees).

Lysimachia Nummularia. In wet meadows, and by the sides of rivulets.

Utricularia vulgaris. In a pool at Oystermouth, (E. Lees). Marshy places on Cromlyn Burrows, and also in the Neath Canal.

Veronica Beccabunga. In ditches and rivulets.

——— *scutellata*. In boggy meadows near Neath.

——— *officinalis*. Woods and pastures, frequent.

——— *montana*. Between the Lamb and Flag and Pont Nedd Vechan, vale of Neath, (E. Lees).

——— *hederifolia*. In cultivated and waste ground.

Linaria spuria. In the cornfields.

——— *Elatine*. In the corn and cultivated places.

——— *minor*. In sandy meadows.

Orobanche barbata. On ivy, on the walls of Oystermouth Castle, and at Britton Ferry.

Teucrium Scorodonia. In woods and bushy places.

Mentha rotundifolia. Very abundant about the banks of Britton Ferry.

——— *arvensis*, var. *β. acutifolia*. About the bauks of Neath Canal, and also about Britton Ferry.

Rumex obtusifolius. In waste ground.

——— *conglomeratus* and *crispus*. Frequent.

——— *sanguineus*. Common by roadsides.

***Polygonum Hydropiper*.** Frequent in watery places.

——— ***mite*.** About Neath and Fabian's Bay.

——— ***aviculare*.** Common in waste ground.

***Parietaria officinalis*.** On old walls in the neighbourhood.

***Euphorbia Peplus*.** In cultivated ground.

——— ***amygdaloides*.** In the woods.

***Acorus Calamus*.** "Britton Ferry; Mr. Player."

***Eriophorum pubescens*.** In great profusion and beauty on a bog called Gors Lwm, on the Banwen, Glyn Neath, (E. Lees).

***Cladium Mariscus*.** In one spot only (as far as I saw), growing up in the hedge by the side of the Cromlyn Canal, in a marshy spot, (E. Lees).

The following additions and corrections have been supplied by MR. GUTCH.

ADDITIONS.

***Polystichum angulare*.** Hedge going from Swansea to Cromlyn Bog.

***Riccia glauca*.** Field on the hill above Cromlyn Bog.

***Jungermannia furcata, multifida, dilatata, inflata, bicuspidata, crenulata* and *polyanthos*.** Cromlyn Bog.

***Calicium sphærocephalum*.** Sketty.

***Opegrapha saxatilis*, *Verrucaria rupestris*, *Endocarpon Hedwigii*.** Rocks on the hills near the Mumbles.

***Endocarpon smaragdulum*.** Stone walls on hills above Cromlyn Bog.

***Psora cæruleo-nigricans*, *Squamaria crassa*.** Rocks on hills near the Mumbles.

***Tetraspora lubrica*, *Entomia rotata*.** Water in an old quarry on hill above Cromlyn bog.

***Rivularia angulosa*.** Cromlyn Bog.

***Mougeotia genuflexa*, *Tyndaridea pectinata*.**

***Zygnema nitidum* and *geminum*.** Pennllergare.

***Cymbella ventricosa*.** Cromlyn Burrows.

***Anabaina Jacobi*.** Cromlyn Bog.

CORRECTIONS.

Phytol. 105, line 18, *for* "gaur" *read* "Gam."

Senebiera didyma (Id. 106) Mr. Dillwyn informs me abounds in rubbish heaps in and about the town of Swansea.

Lepidium Draba (Id.) has been found by Mr. Moggridge; and it grows plentifully by the river side a little higher up than where gathered by Mr. Dillwyn in 1802.

***Linum catharticum*,** (Id. 107). Mr. Dillwyn's name should have been attached to this plant, and not to L. usitatissimum.

Drosera anglica (Id.) has been found by me on the Town Hill in the boggy ground.

——— ***rotundifolia*** and ***longifolia*.** In Cromlyn Bog and Cwm Buchan.

***Lavatera arborea*,** (Id. 117). At Paviland Cave; omitting Loughor Marshes.

***Orobus sylvaticus*,** (Id. p. 108, line 6 from bottom), *for* "Fir Point" *read* "Fir Pont Cadley," meaning "the lands by Cadley Bridge," being the name of the tenement on which it grows.

Vicia lathyroides (Id.) Mr. Dillwyn doubts having been found.

J. W. G. GUTCH.

Art. XCIV. — *Notes on Gentiana Amarella,* (Linn.), *and Gentiana germanica,* (Willd.) By George Luxford, A.L.S. &c.

These remarks are published in the hope that others, who have had an opportunity of examining the plants to which they refer, may be induced to record the results of their investigations in 'The Phytologist.' Mr. Babington's opinion (Phytol. 310) and Mr. Brown's observations (Id. 320) have already appeared in its pages; on the other side of the question I may give the following extract from the 'Gardeners' Chronicle.' —

> "*New British Plant.* — Some years ago Mr. W. Pamplin, bookseller, of Queen-street, Soho, observed a Gentian with large flowers in the neighbourhood of Tring, in Hertfordshire. Following his indication, the Rev. W. H. Coleman of Hertford has obtained specimens which have confirmed him in his suspicion that it would be found distinct from G. Amarella. In fact it proves to be the Gentiana germanica of foreign authors. He observes the following differences between it and G. Amarella: — "The plant is much smaller and less branched, while the flowers are fewer and larger. The leaves are broader — minutely but more distinctly dentate, as are also the segments of the corolla. The calyx is more rounded at the base, and its tube is equal to the segments; while G. Amarella has the segments rather longer than the tube. The segments of the corolla of such specimens of the Gentiana as he has examined, in æstivation overlap those adjacent to them on the right — while those of G. Amarella overlap towards the left. More important differences than these consist in the ovary of Gentiana germanica being stalked and the corolla widest at the throat, while in G. Amarella the ovary is sessile, and the corolla almost cylindrical. Dr. Grisebach has already referred the figures of G. Amarella in 'English Botany' and the 'Flora Londinensis,' to G. germanica; and there can, we think, be no doubt that it and G. Amarella are quite distinct species." — *Gardeners' Chronicle, Oct.* 9, 1841.

The perusal of this paragraph made me determine, whenever an opportunity occurred, to investigate the subject for myself, and, if possible, to satisfy my own mind as to the justness of the claims of the plant called Gentiana germanica to be considered specifically distinct from the Gentiana Amarella of Linnæus. At that time I had seen no authentic specimens of the former plant; my examination was therefore confined to the specimens of G. Amarella in my own herbarium. The results of this examination certainly did not tend to remove certain doubts which previously existed, at the same time, I was not so influenced by them but that my mind remained open to conviction should the evidence subsequently adduced tend in the opposite direction.

A few weeks since Mr. Wm. Pamplin very kindly sent me a recent specimen of a gentian, gathered by him near Streatley, Berks, together with the following remarks: —

"I have the pleasure to enclose herewith a fresh specimen of that large-flowered variety, or whatever it be, which I first gathered near Tring, in Herts, and which some have since considered, I believe, Gentiana germanica of Reichenbach and others.

"I add one or two plants of the common state of Gentiana Amarella, for your comparison."

At last, then, I had in my possession a veritable example of the wished-for plant, as well as additional materials for comparison, and I at once resolved to go to work. The first step to be taken in the enquiry was obviously that of consulting Willdenow, the original authority for Gentiana germanica. The characters assigned by him to the two plants, omitting the synonymes, are the following:—

38. *Gentiana germanica*, W. Corolla 5-cleft, salver-shaped, bearded, segments of the limb ovate, acute: leaves ovate-lanceolate: branches longer than the internodes. —'Species Plantarum,' Berolini, 1797. P. 1346.

39. *Gentiana Amarella*. Corolla 5-cleft, salver-shaped, bearded, segments of the limb lanceolate, acute: leaves lanceolate: branches shorter than the internodes.

Differing from the preceding in its whole habit, shorter branches, narrower and smaller corolla, lanceolate leaves and pale yellow root (radice *flava*).—Id. 1347.

Here, it will be observed, nothing is said about the stipitate ovarium of G. germanica, or the sessile one of G. Amarella. Willdenow's distinctive characters are founded chiefly on differences in the shape of the segments of the corolla, in the form of the leaves, and in the relative length of the branches and internodes. He also, in the remarks above quoted after G. Amarella, applies to its root the same term (*flava*) as Froelich, in the following description of his G. Amarella, applies to *its* root. Froelich's G. Amarella is quoted by Willdenow as a synonyme of G. germanica.

Froelich's description of the plant being very full, I shall give it entire, omitting only his synonymes.

33. *Gentiana Amarella*. Corolla 5-cleft, salver-shaped, acute, throat bearded; segments of the calyx sub-equal.

Hab. in the meadows of Europe. Annual. Flowers in the autumn.

Root simple, fibrous, pale yellow, (*flava*). Stem erect, obsoletely hexagonal, purplish, leafy, branched in a brachiate manner; branches opposite, single-flowered, leafy, frequently many-flowered, of the same height as the plant; frequently more simple, few-flowered, not longer than the corolla. Radical leaves numerous, lying on the ground, obovate, obtuse, narrowing into a petiole, obscurely 3-nerved, withering; stem-leaves sessile, slightly connate at the base, ovate or ovate-lanceolate, more or less acute, rough at the margin, 3-nerved; upper stem-leaves and those on the branches sub-cordate, acute. Flowers terminal and axillary, solitary or two together, erect, an inch long (shorter in small plants), peduncles erect, angular, shorter than the flower. Calyx campanulate, marked with fifteen raised lines, 5-cleft beyond the middle, about half the length of the corolla, segments lanceolate, acute, subequal. Corolla salver-shaped, purple-blue; tube widening upwards, angular, striated, transversely wrinkled between the striæ, contracted and paler at the base; limb 5-cleft, segments ovate-lanceolate, acute, entire, one-third the length of the tube: scales in the mouth of the tube five, membranaceous, white, multifid in a capillary manner at the apex. Stamina:—filaments rather longer than the tube, at the base of which they are inserted; authers oblong, free. Pistil:—germen oblong, on a short stalk (*breviter pedicellatum*), attenuated upwards: stigmas ovate. Capsule oblong, longer than the corolla, stalked. Seeds roundish, rather compressed, smooth, brown. — Froelich, 'De Gentiana Libellus,' Erlangæ, 1796. P. 86.

Then follow the characters and an equally full description of G. pratensis, a native of Russia and Siberia, given by Willdenow as a distinct species, but quoted by Grisebach as synonymous with his G. Amarella, *α*. The following are its characters.

34. *Gentiana pratensis*. Corolla somewhat 5-cleft, salver-shaped, obtuse, throat bearded; segments of the calyx unequal: leaves lanceolate.

At the end of his work, Froelich gives the following interesting account of his meeting with another Gentiana Amarella, apparently distinct from the plant so called by himself and other German botanists.

"After the preceding part was printed, the 1st fasciculus of Dickson's Dried Plants came into my hands; among them is Gentiana Amarella, No. 5, from Derbyshire, in England. The root is like that of Gent. Amarella above described, but yellow, (*lutea*). Stem as in that, also purple, but more slender; ten inches high. Branches beginning at the middle of the stem, shorter than the adjoining internodes, as in Gent. pratensis and campestris; the stem therefore is not pyramidical, as it generally is in our Amarella. Lower leaves spathulato-ovate, the next ovate-lanceolate, the upper ones lanceolate, acute, shorter than the internodes. Flowers terminal and axillary, solitary or in pairs, the lower ones seated on the branches, erect, 9 lines long, 2 lines wide, being thus much smaller than in Amarella as above described. Calyx as in that, and about half the length of the tube of the corolla, rather unequal. Corolla likewise similar, only narrower, and apparently of a paler blue. Stamina the length of the tube. Germen still more attenuated above. This seems to be a species distinct from our Amarella, and if, as appears from the title of the fasciculus, it is named on the authority of the Linnæan herbarium, it must retain the name of Amarella; whilst our plant, the Amarella of German botanists, must receive another name.—Id. 141.

Willdenow, in the following year, published the German Gentiana Amarella in his 'Species Plantarum,' under the name of G. germanica.

Turning now from Froelich and Willdenow to Grisebach, "the latest and best authority on the Gentianeæ," I must confess that I at first found myself somewhat bewildered among his characters of the "four states of each species," and the numerous synonymes assigned to each of these states. I think I cannot better illustrate the uncertainty and difficulty attending this investigation, than by giving the characters of these plants and their varieties, with other essential particulars, as I find them in Grisebach's elaborate 'Genera et Species Gentianearum.' I had intended to give the whole of the synonymes, but finding that by so doing I should considerably lengthen my paper, I determined on quoting merely the references to original authorities and the very few British works.

I may here remark that I have endeavoured to render all these translations as literal as possible, without any attempt at elegance of diction.

Section IV. — Amarella, *Gaud.* Calyx entire, forming a tube. Corolla destitute of the intermediate fold and glands, salver-shaped, internally furnished with a fringed crown, (one species excepted). Stigmata two, distinct. Anthers free. Capsule generally sessile. Testa wingless. Root annual. Style none.

† *Stem erect, branched, branches many-flowered.*

43. *Gentiana Amarella*, L. Stem slender: radical leaves oval-spathulate, upper ones ovate-lanceolate, sessile: lobes of the calyx lanceolate, subequal, shorter than the tube of the corolla: crowned corolla half an inch long, tube cylindrical: linear-oblong ovary and capsule sessile!—From a living plant.

G. Amarella, *Lin. Sp. Pl.* i. 334;* also of the Swedish botanical writers, of the Linnæan herbarium (according to Dickson), and of Smith's specimens collected near Upsal with Linnæus by Ehrhart. Dried specimens, *Dicks. Dried Pl.* 5.

β. uliginosa, W.! Stem short, subsimple, few-flowered: leaves lanceolate: lobes of the calyx rather unequal, about as long as the tube of the corolla: corolla slender, generally 4-cleft, 4 lines long. This appears confined to the north of Germany. Height, 1 to 4 inches.

γ. axillaris, Schm. Stem a foot or less in height, straight: upper leaves very acuminate: cymes axillary, densely flowered, subsessile. Transitions to var. δ. are frequently met with.

δ. pyramidalis, W. herb. Stem straight, much branched, the branches forming a pyramid: cymes axillary, the lower ones on long peduncles, spreading.

Description.—a. Stem slender, rather straight, 6 to 18 inches high, with upright branches, or somewhat simple. Leaves an inch long, shorter than the internodes, their margins appearing serrulated under a lens. Cyme raceme-like, sometimes few-flowered, occasionally compound and forming a slender thyrsus. Lobes of the calyx obtuse, as long as the tube, scarcely half so long as the tube of the corolla. Corolla blue; its tube obconical; the lobes elliptic-lanceolate, about half the length of the tube. Stamina about as long as the tube.

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* The learned author observes, in a foot-note, that "The synonymes of the older writers had better be devoted to eternal oblivion."

Varieties.—A variable species as to the form of the leaves, the length of the calyx and the shape of its lobes; also in the number of parts in the flowers, which are either quaternary or quinary; in its mode of branching, and in the inflorescence, which varies from panicled to 1-flowered and sub-axillary; also in the colour of the corolla, which varies to white. The stem occasionally sends off from its base single-flowered partially decumbent shoots, (Scotland). It is also sometimes somewhat naked, and nodding at the apex, with leaves scarcely half an inch long, rather obtuse and narrow, with few-flowered axillary cymes, rigidly spreading, (stony places in the region of Baikal).—There are scarcely any limits between the other varieties; β. however is more constant.

Observations.—The following remarks will give some idea of the history of this species, the synonymy of which Reichenbach was the first to clear up satisfactorily. Gentiana Amarella is much more frequent in Sweden than G. germanica, if indeed the latter occur there at all, which I very much doubt, since Linnæus was either altogether unacquainted with it, or else did not distinguish it from the former, which is met with everywhere in that country. Ehrhart also collected G. Amarella with Linnæus; and on his return to Hanover, when he first saw G. germanica, he named it G. critica. This name, according to the rule of priority, would have been substituted for Willdenow's, had not Ehrhart's specimens presented a more rare and smaller form, but still having the stipitate ovary. Ehrhart's specimens are identical! with Smith's figure in 'English Botany,' 236, which, by mistake, is given as the G. Amarella of the Linnæan herbarium, and unnaturally represented with a sessile ovary; * it is, however, G. germanica. Dickson, more accurate in this respect, proved the G. pratensis of Froelich to stand in the Linnæan herbarium as G. Amarella; and Smith himself, having subsequently become sensible of his error, in his letter to Panzer written in 1822 (Flora, 1830, p. 529), says that G. germanica is distinct from the G. Amarella of Linnæus.† Sir W.

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* Grisebach appears to be in error here. A very evident though short stalk is represented at the base of the separate ovary in the 'English Botany' figure.

† Sir J. E. Smith, in the second volume of his 'English Flora,' published in 1828, six years after the date of the letter above mentioned, has the following observations under Gentiana Amarella. "G. germanica, Willd. v. 1. 1346, which is G. critica of Ehrhart, Herb. 152, and, according to Swiss specimens, Haller's n. 651 (though the latter indicates many wrong synonyms, and takes it for an English plant), differs from Amarella in having *flowers* nearly twice as large, situated about the upper part of the *stem*, which is of a corymbose form of growth. It may be a good species, but has not yet been observed in England."—p. 31.

Hooker, however, did not consider the two plants to be distinct species; and has consequently again figured G. germanica under the name of G. Amarella; and in thus combining them other botanists agree, but I do not, since I have never seen intermediate forms, nor do I think that the arguments to be drawn from the different geographical stations of the two species, ought to be neglected.

Country. — Damp pastures in the plains of north-western Europe, (50° — 69°), of eastern Europe (even to the Caucasus) and Siberia. Hab. *α.* and *β.* in Scotland; *γ.* in England; *δ.* in the Highlands of Scotland; all on the authority of Hooker! Many foreign localities are given. Flowering in August and September.

Thus far Grisebach upon the distinctive characters of Gentiana Amarella. I cannot help suspecting that two at least of the five species which succeed it should be included among the varieties.

49. *Gentiana germanica*, W! Stem straight, robust: lower leaves spathulate, upper ones ovate-lanceolate, acuminate, sessile: lobes of the calyx subequal, ovate-lanceolate, shorter than the tube of the corolla: crowned corolla 5-cleft, tube gradually widening: linear-oblong ovary and capsule stalked.—From a living plant.

G. germanica, *Willd.! Sp. Pl.* i. 1346. Figure; *Hook. Fl. Lond.* 33.

β. minor, G. W. F. Meyer, (Chl. Hanov. p. 278). Stem short, subsimple: leaves subequal: corolla very large.—From a living plant. Figure; *Eng. Bot.* 236.

γ. præcox. Middle stem-leaves oval, lower ones obtuso-spathulate: calyx as long as the tube of the corolla. — From a living plant. A form which, according to specimens collected in the Alps, near Heiligenblut, flowers in August, has the leaves acuminate, as in *α.*, but the calyx is like that of the present variety; it is in this respect, as well as the time of flowering, a transition to the common form.

δ. caucasica. Stem branched: all the leaves obtuse: lobes of the calyx subulate, distant, twice the length of the tube, and as long as the tube of the corolla. — From a dried specimen. In the Carpathians it passes to *α.* Figure; *Sims, Bot. Mag.* 1038.

Description. — *α.* Stem generally a foot high, variable in ramification. Leaves two inches long, equalling the internodes, their margin appearing serrulated under a lens, point rather obtuse. Cyme truly compound, forming a panicle nearly a foot long; erect indeed, but more spreading than in G. Amarella. Lobes of the calyx acuminate, equal, as long as its tube, half the length of the tube of the corolla. — Corolla blackish-blue, varying to violet; tube obconical! lobes ovate, acute, mucronate.

Varieties. — A very variable species. Besides the forms given in the synonymes, the following are worthy of being mentioned. Under *α.* Lobes of the calyx abbreviated, rather unequal. Corolla 2 inches long, lobes elongated, elliptic-lanceolate, as long as the tube! (perhaps a monstrosity). Branches elongate, fastigiate, (approaching γ). Under β. Leaves short, obtuse, lobes of calyx abbreviated, (approaching γ). Stem slender, 1-flowered, leaves very short, sub-rotund! — Under δ. Lower leaves rosulate, spathulate, subrotund, (transition to γ). Calyx cleft on either side. Corolla 4-cleft.

Country. — Dry gravelly meadows and pastures, mountains and alpine situations at a height of from 150 to 6200 feet, in central Europe and the Caucasus. Hab. α. in England, according to a specimen collected near Ripon, (Hook.!) Flowers from August to October.

Under the name of Gentiana campestri-germanica, Grisebach also describes a plant which he considers to be a hybrid between G. germanica and G. campestris. The flower is 5-cleft, the calyx having two of its lobes much larger than the rest.

It will, I think, be considered quite unnecessary for me to give quotations from the works of any other continental botanists than those already referred to, who are all intimately connected with the subject under discussion; — Willdenow from being the original authority for G. germanica, Froelich from the full descriptions contained in his Libellus of the species of Gentiana known at the time it was written, and Grisebach, from his elaborate Monograph of the whole order, in which work he has devoted considerable space to the illustration of the plants now before us. I am, however, truly gratified in being able to close this part of the enquiry with a short extract from the *fifth* edition of Hooker's 'British Flora,' published only within the last fortnight. The two plants stand therein as distinct species; the characters assigned to each being substantially the same as Grisebach's, already given, I need not quote them: the following remarks, under G. germanica, will, however, show that although the opinions of the learned author, in deference perhaps to the high authority of Grisebach, may have been somewhat modified since the publication of the 'Flora Londinensis,' he evidently considers the question as still open to discussion.

> "In the 'Flora Londinensis' I stated it as my opinion that the G. Amarella and G. germanica were not specifically different. Grisebach, Koch, and others think differently; and as the former author has examined and made his remarks on the specimens in my herbarium, I have given his characters, and would direct the attention of botanists to the subject. Mr. H. Watson is of opinion that they are but trifling varieties of each other. In all my numerous specimens of G. Amarella, the plant takes a more or less pyramidal form, and the flowers are far more numerous, crowded, and considerably smaller than in G. germanica."—Hook. Br. Fl. i. 219. Ed. 5, Oct. 1842.

Since the preceding part was written I have again examined and compared all the specimens of Gentiana at my command, that can be referred to either of the two forms. This examination has led to the following conclusions.

1. That no character can be derived from either the positive or relative size of either plants or flowers; both forms being exceedingly and equally variable in this respect. The specimen from near Streatley is much larger, more branched, and with many more flowers than the specimens of G. Amarella which accompanied it; the reverse of these conditions obtained in the plants mentioned in the extract from the 'Gardeners' Chronicle' (Phytol. 381).

2. That no dependence can be placed on the relative proportions of the leaves, branches, and internodes; these proportions frequently varying even in the same individual. In the Streatley specimen some of the branches are shorter, others are longer, than the internodes of the stem, while the leaves are shorter. The same remarks will equally apply to large-flowered continental plants, and to British specimens of G. Amarella.

3. That in form both the leaves and calyx-lobes are variable; and the proportion borne by the latter to the tube of the calyx differs in the same specimen.

4. That although the tube of the corolla may, in some specimens, be correctly described as cylindrical, and in others as gradually widening upwards, yet intermediate forms are extremely common. And Grisebach, in his descriptions, calls them both "obconical," as Mr. Brown has already remarked, (Phytol. 320).

5. That with respect to the stalk (*stipes*) of the ovary, if by that term is to be understood a stalk separate and distinct from the substance of the ovary supported by it, similar to that represented in tab. 236, 'English Botany,' then such a stalk I have not been able to find either in the Berkshire plant before mentioned, in continental specimens, or in any others that can possibly be referred to G. germanica.

6. That if, on the contrary, by the term *stipes* we are to understand such a gradual diminution of size in the base of the ovary itself, as would probably be produced by the shrinking of that part, as suggested by Mr. Brown, then such a stalk I find to be more or less evident in every specimen that I have examined, whether referrible to G. Amarella or G. germanica.

7. Moreover, in undoubted specimens of G. Amarella, gathered rather late in the season, I find some flowers with mature capsules, which contain ripe seeds, and are generally perfectly *sessile;* while in

other flowers on the same plant, sometimes even in those on the same branch, the ovary being immature when the plant was gathered, it is *stalked*, apparently in consequence of the shrinking of the lower part in the manner described.

Lastly: as a necessary consequence of the above conclusions, and in the absence of more positive evidence than any we at present possess, I think I shall be warranted in considering the numerous forms of the two plants as all belonging to one variable species.

I shall be gratified by receiving specimens of any form of these plants for further examination; and earnestly hope that the subject will be taken up by more able botanists, who will favour the public with the result of their enquiries. **GEO. LUXFORD.**

65, Ratcliff Highway, October 25, 1842.

ART. XCV.—*Some Account of the Botanical Collections recently made by Dr. Theodore Kotschy (for the Wurtemburg Botanical Union) in Nubia and Cordofan.** Communicated by MR. WILLIAM PAMPLIN, jun.

THE collection of dried Nubian plants (amounting to nearly four hundred species) made by Dr. Theodore Kotschy in 1839, possesses so much interest, not only to the members of the Wurtemburg Union among whom the plants are distributed, but also to the botanical world at large, that Dr. Schnizlein, in the hope of rendering an acceptable service to botanical Geography, has kindly undertaken the task of enumerating and comparing them with the materials already known as forming part of the Floras of Egypt, Arabia, Eastern India and Western Africa. So favourable an opportunity of acquiring a knowledge of the vegetation of the eastern part of Africa, will not probably soon occur again.

In the first place, with respect to the condition of the plants, it is quite evident, on inspection, that they have been prepared with great care; of some there are specimens both in flower and fruit; all are exceedingly well preserved; and of many species the specimens are numerous. We find twenty species in the most excellent state; two hundred and fifty-six in perfectly good condition; and only about forty which are not quite complete, or, in other words, less perfect: in fact, altogether, they could not have been expected to arrive in a better state, for they are neither broken nor otherwise injured, and frequently several specimens of one species are given, and reckoned only as one: it must, however, be acknowledged, that on the whole a majority of small-sized plants occur, and a few of the larger ones, such as shrubs and trees, are cut into small pieces and occasionally divested of the root, probably with the view of economizing the space required in packing them.

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* Translated and abridged from the 'Regensberg Flora oder Botanische Zeitung' for 1842.

Among the greatest ornaments of the collection, the following may be particularized. The two splendidly dried Utricularias—U. inflexa and U. stellaris, the new and delicate Udora cordofana. The superb grasses Fimbristylis hispidula, Isolepis prælongata, Cyperus aristatus, squarrosus, resinosus, Lappago orientalis, seven species of Aristida, Ctenium elegans, the ornamental Triachyrum cordofanum, Chloris spathacea, Pennisetum lanuginosum, Panicum Petiverii. Isnardia lythrarioides, Heliotropium pallens; the magnificent Ipomœa repens, a bog plant, with large rose-coloured flowers; the small but extraordinary Conomitra linearis, with its orbicular and long-pointed pod; the conspicuous Mollugo bellidifolia; but above all, that rare and remarkable plant the Neptunia stolonifera, whose root-stem reminds one of our Phellandria, the heads of flowers of Œnanthe, while the leaves and the fruit resemble those of a Mimosa; Poivrea aculeata, Guiera senegalensis, six Cassias, four Bergias, the three splendid Nymphæas—cærulea, Lotus and ampla; Striga orchidea, Acanthodium hirtum, Pedalium Caillaudii, Melhunia Kotschyi, Monsonia senegalensis, Daleschampia cordofana, four Pavonias, five Hibiscus, eight Sidas; the fine Acacias—papyracea and seriocephala: altogether we have thirty-nine species of Papilionaceæ, among which the Requienia obovata and the two species of Alyssicarpus are worth noticing; the remarkably well named Euphorbias—acalyphoides, covolvuloides and polycnemoides.

In the second place, the principal districts and localities in which Dr. Th. Kotschy made his collections are to be noted. They are as follow:—first in the province of CORDOFAN, the city Obied, with the neighbouring mountain Arasch Cool, the lake Tara, and the river Choor; then the villages Abu-Gerad, Bara Chursi, Hogeli, Tejara and Uagle; then the more southerly situated town Tekele, and the mountain Kohn: second, in the province SENNAAR, the village Wolet Medine, Gujeschab on the Nile, then the islands by the cataracts of the White Nile, at the mountain Gerri.

W. PAMPLIN, JUN.

(To be continued).

ART. XCVI.—*Analytical Notice of the 'Transactions of the Botanical Society.' Vol.* i. *pt.* ii. Edinburgh: Maclachlan, Stewart & Co.; H. Baillière, London. 1841.

(Continued from p. 364).

XIII. *Remarks on the Structure and Morphology of Marchantia. By* GEORGE DICKIE, *Lecturer on Botany at Aberdeen.*

THE author's observations refer chiefly to Marchantia polymorpha; and they are arranged under two heads: "1. The structure of Marchantia. 2. The inferences to be drawn from the facts exposed under the first head." The paper is illustrated by figures.

In the first division of his subject Mr. Dickie describes the structure of the frond, and the fructification. In speaking of the lower surface of the frond he states that what is called by Sir W. J. Hooker a "prominent blackish midrib," "is in reality a groove in the frond, from the edges of which originate purplish scales, which, by meeting, conceal the groove; in this groove are numerous transparent filaments." Many short radicles originate from the surface of the frond at the sides of the groove.

The receptacles of both the (so-called) male and female reproductive organs, are supported by peduncles; these originate "from the grooves on the lower surface of the frond, and are grooved in a similar manner, the peduncles and their posterior grooves being continuous with the frond and the groove on its inferior surface. In each of the grooves is lodged a bundle of transparent tubular filaments, the walls of which "are covered with green granules, often arranged in a spiral manner." The lower end of the filaments is blunt and closed, the upper extremity spreads over the inferior surface of the receptacle, sending off a bundle to each lobe or ray of the former. The filaments at this part "are covered with overlapping scales, similar to those of the lower surface of the frond."

What are generally considered to be male receptacles are lobed at the margin, while the female receptacles are rayed; the rays, however, are stated to be "merely lobes bent upon themselves, from above downwards." A perpendicular section of the male receptacle shows it to consist of cellular tissue enclosed between two membranes. In the tissue "are embedded numerous flask-shaped sacs, with long necks, terminating each by an orifice on the upper surface of the receptacle. * * The sacs contain the bodies called *anthers*, which vary in form according to the stage of development at which they are examined. Each of these bodies consists of a cellular sac filled with a granular matter." For a correct description of the fertile receptacles, with their involucres and capsules, the author refers to Sir W. J. Hooker's account of those parts.

Under the head of *Morphology*, the author institutes an enquiry into the true nature of the peduncles, and of the so-called male receptacles and anthers; and shows that the latter bodies bear no relation to those organs in flowering plants. He is of opinion that the lobed receptacles and the peduncles "may be considered as metamorphosed fronds," of which a longitudinal section shows them to be continuations; "the grooves of the peduncles are continuations of the grooves on the lower surface of the fronds, and they enclose the same spirally dotted filaments."

> "The flat receptacle is lobed like the fronds, its structure is the same, on the lower surface, filaments in grooves covered with scales, and a cuticle with stomata on the upper surface; and the fact that one of the notches is larger than any of the others, and the concavity on one side of the peduncle, appear to lead to the inference, that this receptacle is a small frond folded horizontally upon itself. In M. conica the relation of the two is more evident, the receptacle in this species being sessile, and still more so in that variety of M. hemisphærica where the receptacles are always sessile, and embedded, as it were in the substance of the frond."—p. 110.

With respect to the bodies termed anthers, the author institutes a comparison between them as found in Marchantia and Riccia, a nearly allied genus. In the latter genus the capsules are spherical, in Marchantia the sacs "are flask-shaped, and have a long neck protruding by an orifice at the surface." The inclosed bodies also differ somewhat in shape, but in both genera they consist of "a cellular membrane enclosing minute granules." Hence the author is disposed to consider these bodies as gemmæ, or one means by which young plants are produced, but remarks that "it may appear rash to arrive at any such conclusion until they are actually seen to germinate under favourable circumstances."

XIV. *Remarks on some curious Metamorphoses of the Pistil of Salix caprea.*

By the Rev. J. E. LEEFE, M.A., *Audley End, Essex.*

THE author commences his remarks by quoting Professor Lindley's observation, that the pistil is seldom found "converted *into stamens*, but it often takes upon itself the form of petals, and although *cases are very rare* of pistils bearing *pollen*, yet several instances are known of ovules being borne by the stamens." This rare instance of conversion occurred in the catkins of an apparently healthy plant of Salix caprea, growing on the banks of the Cam, near Audley End, Essex.

"The catkins were of a light green colour, longer, and tapering to a point, instead of being blunt, as is usual in S. caprea. In one case three apparently proceeded from the same bud. The nectary and scale were very little altered, and the change is very various in its character, and several intermediate forms occur in addition to those which I am about to mention. Those enumerated are, however, the most remarkable. I may here mention, that I do not mean that all the forms are to be found in the same catkin, and also that the greatest alteration is observable in the flowers at the apex and base of the catkins.

"1. Styles two, each bearing at the top two small pale stigmas; in other respects as usual.

"2. Scale and nectary as usual. Stalk of the ovarium extremely lengthened, resembling a filament, downy, especially towards the base, terminating in an ovarium. Style cloven, the cleft penetrating the substance of the ovarium; at the base of the cloven style, on *one face* only, appeared two yellow bodies like the lobes of an anther.

"3. Stalk greatly lengthened. Ovarium silky, not much altered at the base; stigmas almost entirely obliterated; instead of them a vertical depression or sinus, on each side of which was a yellow antheriform body, erumpent from the substance of the ovarium. These contained *perfect pollen*, and in the lower ovarium-like portion I remarked several ovules.

"4. Stalk forked or branched near the top, each fork bearing a silky body resembling an ovarium.

"5. Stalk forked; one fork filament-like, and tipped with an anther yielding pollen; the other silky, approaching an ovarium in form, and containing ovules.

"6. In this form, in which the nearest approach to a stamen was made, each fork bearing an anther containing pollen, and the ovarium being entirely obliterated, traces of the original structure are to be seen in the bifurcated filament analogous to the two stigmas."—p. 113.

All these various forms are illustrated by figures.

XV. *Descriptions of Jungermannia ulicina (Taylor), and of J. Lyoni (Taylor).* *By* THOMAS TAYLOR, M.D., M.R.I.A., *Dunkerron, Kenmare, Kerry.*

1. *Jungermannia ulicina*, (Taylor). Stem creeping, filiform, branched: leaves distichous, roundish-ovate, concave, bilobate, inferior lacinia much the smaller, involute; stipules ovate, bifid: fruit axillary; perichætium three-leaved, compressed, two upper leaves narrow at the base, roundish-oblong, inner margins incurved; lower leaves oblong-ovate, bifid.

On stems of Ulex europæus and Erica cinerea, "on wet banks facing the north, over Finnehy river, near Kenmare, Co. of Kerry; (T. T.) At Dolgelly, North Wales; Mr. W. Wilson."

A minute species, bearing a strong resemblance to J. minutissima, *Sm.*; from which it may be distinguished by the presence of stipules, by the large, flattened, three-leaved perichætium, by the cauline leaves increasing in size as they approach the perichætium, by the skin being less flexuose, by the leaves being more distant, and by the paler colour of the whole plant.

Dr. Taylor refers to Hooker's 'British Jungermanniæ,' tab. lii. fig. 3, as being "a just representation of the stem, leaves, and stipules of J. ulicina;" and observes,

> "It is remarkable that on the same stems of furze in the above locality, grew every one of the minute tribe to which the present species is allied, viz., J. minutissima, J. hamatifolia, J. calyptrifolia, and J. serpyllifolia."—p. 116.

2. *Jungermannia Lyoni*, (Taylor). Stem ascending, somewhat branched: leaves distichous, alternate, somewhat quadrate, concave, recurved, trifid; anterior lacinia rounded in front, posterior one reflexed, all acute or terminated by a single large tooth; stipules none: fruit at length lateral; calyces oblong, obtuse, inflated, rather naked at the base, mouth fringed and plaited.

> "So great is the force of individual vegetation, that within the calyx, and alongside the pistilla, a bud may sometimes be seen to arise, and at length to emerge out of the calyx, clothed with leaves. Perhaps this viviparous condition of the calyx has not yet been observed in any other species. The plant nearest in natural affinity is probably J. orcadensis, *Hook.*, equally destitute of stipules, having a similar erect, scarcely-branched stem, growing up among tufts of mosses, but differing, 1st, by the leaves being simply emarginated, 2nd, by their margins being recurved, and so assuming, when moist, a convex and tumid appearance in front."—p. 117.

Resembling J. barbata, *Schreb.* and J. incisa, *Schrad.*, but differing from the former in the presence of stipules, in its more oblong calyx, and in its less concave, subsquarrose leaves, which are also less imbricated; and from the latter, in its larger size and ascending stems, in the leaves being anteriorly rounded and entire, with their lower lacinia reflexed and their cells smaller, in the more tumid and less plicate calyx, in its squarrose perichætial leaves, in the leaves being more distant and paler in colour.

This species is described at considerable length, and illustrated by figures.

XVI. *Extracts from the Minute-Book of the Botanical Society, from November*, 1840, *to July*, 1841.

1840, *December* 10. Read, Extracts from a letter addressed to the Secretary, by the Rev. T. B. Bell, dated December 3, 1840, containing "Observations on the specific distinctions between Asplenium Ruta-muraria, and A. alternifolium."

Mr. Bell observes,—"I am aware some botanists have remarked, that attenuated forms of Asplenium Ruta-muraria approach indefinitely near A. alternifolium. I believe the two species have occasionally been confounded, but I always regarded this as a mistake into which no one could fall who had *perfect* specimens before him, and who was not prepared to substitute the general aspect and habit of the plants for their specific characters. As Mr. Newman, in his recent publication on Ferns, has fallen into this mistake, and conjoined the species, I think it not out of place to communicate to the Botanical Society the following brief observations: —

"The first character is taken from the form of the frond, which is correctly stated by Sir William Hooker to be bipinnate in A. Ruta-muraria, and, in alternifolium, pinnate, the lower pinna ternate; the pinnæ in both being alternate. Now so far from its being the tendency of attenuated or contracted forms of A. Ruta-muraria to approach the pinnate form of alternifolium—the truth of the matter is, that the more attenuated the former is, the more distinctly bipinnate does it become, or in other words, the nearer A. Ruta-muraria approaches alternifolium in its general aspect and habit, the further and more visibly does it diverge in *this* character.

"The second character is taken from the indusium, with regard to which it is hardly necessary to remark, that while that of alternifolium has a smooth even edge, the edge in all varieties of Ruta-muraria is invariably jagged or uneven, and this is quite visible to the naked eye."—p. 119.

1841, *January* 14. Dr. E. F. Kelaart made some "Observations on the cultivation &c. of Cinnamomum zeylanicum."

In these observations the cinnamon plantations of Ceylon were described at considerable length, and the distinguishing qualities of the three principal varieties of cinnamon mentioned. He also alluded to the Malabar cinnamon, "which included several sorts in one parcel, but amongst which only a few pieces are equal to the finer qualities of Ceylon cinnamon." It was also remarked that the Cassia lignea of commerce is of three kinds; — "that from China, sometimes called Chinese cinnamon; that from the islands bordering on China; and that from the continent of India." The former appears to be distinct from all the varieties of cinnamon, from which it differs in its texture, taste, colour, and other characters; "the quills of cassia are made of single rolls of bark — those of cinnamon are distinguished by being composed of several, one within the other." The different products of cinnamon were described, and observations made on the botanical characters of the plants which yield the cinnamon and cassia of commerce; allusions were also made to the difficulties attending the investigation, caused by the contradictory statements of authors. The history of the various researches into the subject was adverted to, and Dr. K. concluded his observations with a brief description of the "several species of cinnamon growing in Ceylon, Java, and the Malabar coast; as also of the Cinnamomum aromaticum, or Laurus Cassia of Nees Von Esenbeck."

Prof. Christison observed that for the last twenty-five years nothing had been imported from Ceylon under the name of cassia-bark, and stated his reasons for believing the greater part of it to come from Canton. He also made some remarks on the plants from which the bark is produced.

Read, A Communication from Mr. T. Edmonston, jun., Balta Sound, Shetland, "On the native dyes of the Shetland Islands."

After some remarks on the materials formerly used for dying in the Shetland Isles, the author observes that the colours now made are only *brown*, *red*, *yellow* and *black*, to produce which the following plants are used. *Brown;* Parmelia saxatilis, called *Scrottyie*. *Red;* Lecanora tartarea, called *Korkalett*. *Black;* Spiræa Ulmaria. *Yellow;* Stachys palustris, the die is called *Hundie:* Galium verum is said to be used for the same colour in the parish of North Mavin. Besides these, the juice of the berries of *Empetrum nigrum* furnish a beautiful purplish-blue. The mode of using these different materials was explained.

February 11. Read, Notice of the discovery of the cones of Pinus Mughus (*Jacq.*), in peat bogs in Ireland. By Mr. Charles C. Babington, Cambridge. The specimen sent to the Society was found under "six feet of solid peat bog at Burrishoole, near Newport, Mayo." Prof. Don was of opinion that it was a "cone of Pinus Mughus, *Jacq.*, which, however, he considered a variety of P. sylvestris, but quite different from any of the varieties now native in Scotland."

"It is interesting to find that a tree which must have formed at least a portion of the native forest of that wild part of Ireland, in which a tree is now scarcely to be found, should be thus proved to belong to a form of Pinus not now native in Britain, but confined, I believe, to the Austrian Alps. The native forests of that part of Ireland have now been totally destroyed for about two hundred years, one clause in the original grants to English settlers having required their destruction and employment in the smelting of iron. Professor Don states, that these cones agree exactly with others that he has seen from the bogs of Armagh."—p. 126.

March 25. Read, a Notice of the disappearance of plants from particular localities. By Mr. J. Just, Bury, Lancashire. The first plant mentioned is Lepidium Smithii, *Hook.*, of which, in the summer of 1840, the author could not find a single specimen in a locality where it had previously abounded, although there was no apparent cause for its disappearance. Orchis maculata and the white-flowered variety of Orchis mascula are other cases mentioned. The white-flowered varieties of Myosotis sylvatica and Geranium robertianum, were introduced into a garden and allowed to shed their seeds, the plants from which show a disposition to revert to the original colour.

April 8. Mr. James Mc'Nab made a communication "On some anomalous methods of cultivating plants in hot-houses." This communication, with several illustrative wood-cuts, appeared in the 'Gardeners' Chronicle' for August 14, 1841. The plants experimented on were Ficus elastica, Polypodium aureum, Acrostichum alcicorne, Euphorbia splendens and Bilbergia nudicaulis. The roots were first denuded of the soil; the plants of Ficus were suspended from the roof in various ways, with their roots entirely exposed; the Polypodium, Acrostichum and Euphorbia had their roots covered with moss, they were then suspended from the roof in an inverted position. All the plants thus treated grew well, and the ferns had a very handsome appearance.

July 8. Dr. Douglas Maclagan read a notice of the Chemical Constitution of the Fruit of a species of Phytelephas, commonly called "Vegetable Ivory." This fruit is the product of a South American plant, and has lately been much used as a substitute for ivory. The seed is triangular, from 1½ to 2½ inches long and from 1 to 2 broad; its substance is hard, and closely resembling ivory in its physical characters. The specimen examined, on being cut across, was found to have a cavity in the centre, the walls of which were soft and yielded to the nail. A portion of the white matter, including part of both the soft and hard substance, was analysed by the action of cold and hot water, alcohol, and subsequent incineration. The constituents of the portion examined are then stated, with their several proportions; and the results of a subsequent analysis of the ashes are also given. The notice is concluded with the statement that "from these experiments it appeared that there was nothing in the chemical constitution of the vegetable ivory, which could account for its hardness, which must be due only to a peculiar texture in the woody fibre."—p. 131.

ART. XCVII. —*Varieties.*

222. *Note on Primulas.* I have no other observation to make on the common yellow Primulæ, than that in the district haunted by me, in canton Appenzell, varying from 3000 to 8000 feet above the sea, not a specimen of P. veris (cowslip), or P. vulgaris (primrose), was to be seen, or, by the most diligent enquiry, had ever been heard of, that I could find. P. elatior (oxlip) was everywhere over the meadows, peeping up among the very earliest, on the first warm patches cleared of snow in *February*, and continuing to gladden the eye, more or less sparingly, according to the altitude and protection, until all is again covered up with snow in *November*. P. veris abounded

in the valleys below up to 1200 or 1400 feet. P. vulgaris I never saw in that part of Switzerland.—*Wm. Bennett*; 21, *King William Street*, *Sept.* 20, 1842.

223. *Economical Use of the Dock.* As a counterpart to Mr. Lees's statement of the domestic use of the fern in the forest of Dean (Phytol. 263), I beg leave to add the following similar use of the neglected dock in this neighbourhood. In summers when food for pigs is scarce or difficult to be procured, the *dernier resort* of the housewife is the dock, which is then gathered and boiled in the manner described in the before-mentioned statement; sometimes mixed with a few potatoes or a little barley-meal, it forms a very nice mess to help through the time of scarcity. Another use of them to the farmer's wife is as wrappers for her butter in bringing it to market, the greater portion being wrapped up in dock-leaves after they are washed clean; it is only after these have failed, on the approach of winter, that they begin to use the cloth wrappers. —*James Bladon*; *Pont-y-pool*, *September* 14, 1842.

224. *Enquiry respecting Bryum pyriforme.* Perhaps some of your readers would be able to say if the plant described in 'English Flora' under the name of Bryum pyriforme be the same as the one figured in 'Muscologia Britannica' under the same name. A short time ago as I was examining a few specimens of what I thought to be Bryum pyriforme, I was greatly surprised to find them so much at variance with the description of that plant by Sir W. Hooker, in 'English Flora,' vol. v. p. 60, wherein he says—"This differs from all other Brya in the remarkable shape of its *leaves*, which are almost wholly composed of *nerve*, except at the base, and there deeply serrated."—The point in which my plants differ from the description given by Sir W. Hooker, consists in the leaves being quite *smooth* on their edges. On turning to the 'Muscologia Britannica,' I find the figure in that work to represent leaves which are smooth at the base and somewhat serrated at the point. It will be evident, on examination, that the description above quoted and the figure in 'Musc. Brit.' do present characters sufficiently distinct to justify the adoption of two species. — *Samuel Gibson*; *Hebden Bridge*, *October* 15, 1842.

225. *Note on Equisetum variegatum, var. Mackaii.* I have received the following communication from Dr. Scouler, correcting some mistakes into which he supposes I have fallen respecting the history of the Equiseta. He states that the var. Mackaii, or "E. elongatum of Hooker, was recognised as a distinct species by Mr. Whitla of Belfast, but that this gentleman's views were not adopted by any Irish botanist until the beginning of the present year. The plant was first found by Mr. Whitla in Colin Glen, near Belfast; afterwards, in 1833, he found it in the Deer-park, near Glenarne. The remarkable variety of E. variegatum growing on the margin of the canal near Dublin, was found by Mr. Johnson, a very acute botanist." — *Edward Newman*; 2, *Hanover St.*, *Peckham*, *October* 20, 1842.

226. *County Lists of British Ferns.* I most earnestly solicit from those botanists who may read this notice, assistance in forming a correct and complete county list of all the British species of ferns and allied genera. The plan I wish adopted is to give the name of every species that may occur, however common, because I regard it as quite possible that even such species as Asplenium Ruta-muraria, Pteris aquilina and Lastræa Filix-mas, may not occur in every county, and their non-occurrence would thus become known and a curious fact established. All observations and localities which the writers may consider of value are also solicited, especially with regard to the rarer species. It is my intention to use these lists as data for a general work; each, if permission be given by the writer, will be handed over to 'The Phytologist,' for inser-

tion in its pages, prior to any other use being made of it. The subjoined list of Herefordshire ferns only, as far as I have had an opportunity of observing them, will perhaps show what is desired.

List of the Ferns of Herefordshire.

- Lomaria Spicant. Abundant: Dinmore Hill, Shobden-hill woods, &c.
- Pteris aquilina
- Allosorus crispus. Malvern Hills, (*E. Lees*).
- Polypodium vulgare
  - Phegopteris. Aymestree quarry, Shobden-hill woods.
  - Dryopteris. Ditto, ditto.
- Polystichum angulare
  - aculeatum
  - lobatum
- Lastræa Oreopteris. West Hope, Dinmore, Aymestree quarry.
  - Filix-mas
  - dilatata
- Lastræa spinulosa
- Athyrium Filix-fœmina
  - irriguum
- Asplenium Adiantum-nigrum
  - Ruta-muraria
  - Trichomanes
- Scolopendrium vulgare
- Ceterach officinarum. Abundant: garden walls in the borough of Leominster.
- Ophioglossum vulgatum
- Cystopteris fragilis has been recorded as growing near Ludlow, but I am neither certain as to the locality nor the authority.

Each named variety might be recorded as a species, in order to save trouble: and where a species is recorded as having been found in a county, and the writer has not himself found it, the name of the finder or recorder might be added in parentheses. —*Id.*

Art. XCVIII. — *Proceedings of Societies.*

BOTANICAL SOCIETY OF LONDON.

October 7, 1842.—Adam Gerard, Esq. in the chair. Donations to the library were announced from G. Francis, Esq. British plants were received from the Rev. A. Bloxham, Dr. Bossey, Messrs. Fordham, Bidwell, Doubleday, Holman, &c.

Mr. D. Stock, of Bungay, Suffolk, presented monstrosities, collected by him at Earsham, Norfolk, of Scolopendrium vulgare bearing two fronds, the one being barren and reniform, the other bearing sori and elongated, with the midrib spirally twisted. Also of *Aspidium lobatum*, with the rachis much abbreviated and slightly recurved, pinnæ numerous and overlapping; and of two abortive specimens of a rose from his garden, both of which produced perfectly formed and leafy branches from the axis of the flowers. Mr. Stock also presented specimens of *Thelephora caryophyllea* (new to Great Britain), discovered by him in August, 1841, in a plantation at Bungay, Suffolk. This is distinct from *Thel. terrestris* (syn. *Auricularia caryophyllea*, Bulliard), and *Thel. laciniata* (syn. *Helvella caryophyllea*, Bolton, and *Auricularia caryophyllea*, Sowerby).

Mr. John Thompson exhibited specimens of *Carex irrigua*, Sm., collected by him at Muckle Moss, near Thorngrafton, Northumberland. Mr. Thomas Twining, jun., exhibited a large collection of cultivated specimens from Twickenham.

Read, the continuation of a paper from Mr. R. S. Hill, being "An Enquiry into Vegetable Morphology."

Irregular Metamorphoses of flowers are extremely common, and usually consist either of an actual multiplication of petals, or of the transformation of stamens and pistils into petals; the effect of these changes being the formation of double flowers, the impletion of which appears to take place in different ways in different plants. In most Icosandrous and Polyandrous plants, impletion appears to result almost entirely from the conversion of the stamens, and in some instances of the pistils, into petals; in the double varieties of *Ulex europæus* it results from the same change. In Oligandrous plants we usually find an actual multiplication of petals; as may be seen in the double stocks and wallflowers of our gardens. Where the impletion is the result of this alteration of the essential floral organs, the plants are necessarily barren. Such, however, is not the case with the Dahlia, Aster, and other plants which belong to the Corymbiferous section of Compositæ; in these the impletion results, first, from the change of the tubular florets of the disk into ligulate florets, the same as those of the ray, as in the Dahlia, and, secondly, by the simple enlargement and elongation of the tubular florets, as in the many varieties of the China Aster. Such monstrosities, from the fact of the essential organs not being in any way implicated, are capable of perfectly impregnating their ovules. Thus a knowledge of the mode in which impletion occurs, is of importance to the gardener, in order that he may be enabled to calculate on the possibility of producing new varieties by seed.

Dr. Lindley says that "these changes always occur in the order of development, or from the circumference to the centre; that is to say, that the calyx is transformed into petals, petals into stamens, and stamens into ovaria; but that the reverse does not take place." In proof of this hypothesis he further says "that if the metamorphosis took place from the centre to the circumference, or in a direction inverse to the order of development, it would not be easy to show the cause of the greater beauty of double flowers than of single; because the inevitable consequence of a reversed order of transformation would be that the rich or delicate colour of the petals, upon which all flowers depend for their beauty, would be converted into the uniform green of the calyx. Such a change therefore, instead of increasing the beauty of a flower, and making it superior to its original, would tend to destroy its beauty altogether." Now were this hypothesis correct, and founded on fact, what ought to be the condition in which we find the organs in double flowers? We ought surely to find the centre of the flower filled up with an increased number of pistils. But is this the case? It is plain it is not; indeed, were it the case, the beauty of a double flower would be most effectually destroyed. This theory must therefore fall to the ground, and we must confess that we are unable to find any laws by which the order of transmutation, in such monsters, is governed.

The aim and object with the cultivators of double flowers, is to convert all the floral organs into petals, and we generally refer to cultivation as the cause of flowers becoming double; farther than this we are ignorant of the causes of their impletion.—They probably owe their origin, at first, to accidental circumstances, and afterwards the variety is carefully propagated by the methods usually adopted for that purpose.

The two classes of vegetable functions, namely, the vegetative and reproductive, notwithstanding their close connexion, appear to be performed, in some degree, in opposition the one to the other; thus any excessive development of the one class, takes place at the expense of the other.—*T. S.*